بسم الله الرحمن الرحيم

**King Abdulaziz University**
**Engineering College**
**Department of MENG**
**3rd Homework Assignment**

**Mechanical Vibrations**
**MENG 470**
**Spring 1425 H**
**Due Wed.: 19/1/1425 H**

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1) Give the amplitude, frequency, and period of oscillation for the signal illustrated in Figure P1.1.

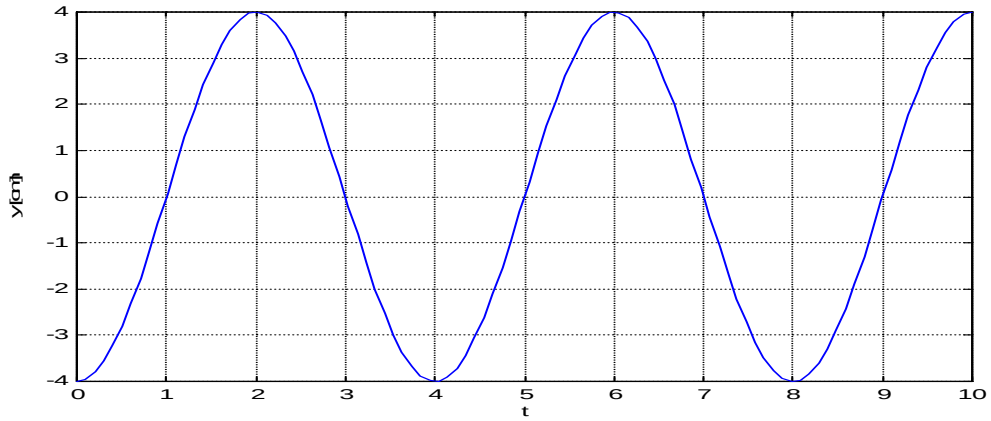


Figure 1

2) What is the natural frequency for the system illustrated in Figure 2 in terms of $m$, $k_1$, $k_2$, $k_3$ and $k_4$?

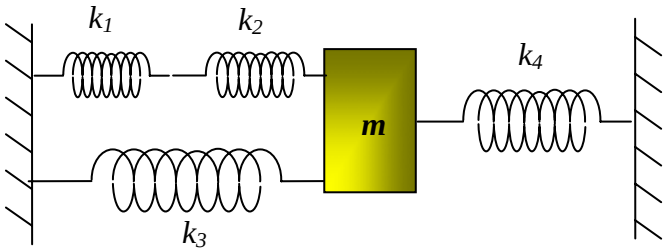


Figure 2

3) Derive the equation of motion of the system shown in Figure 3, using the following methods: (a) Newton's second law of motion, (b) D'Alembert's principle, (c) principle of virtual work, and (d) principle of conservation of energy.

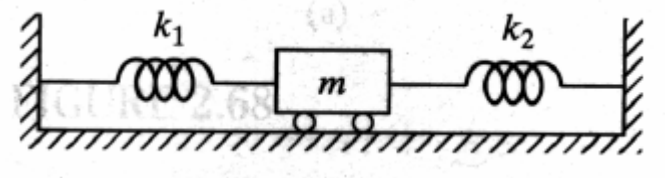


Figure 3

4) Draw the free-body diagram and derive the equation of motion using Newton's second law of motion for each of the systems shown in Figure 4.

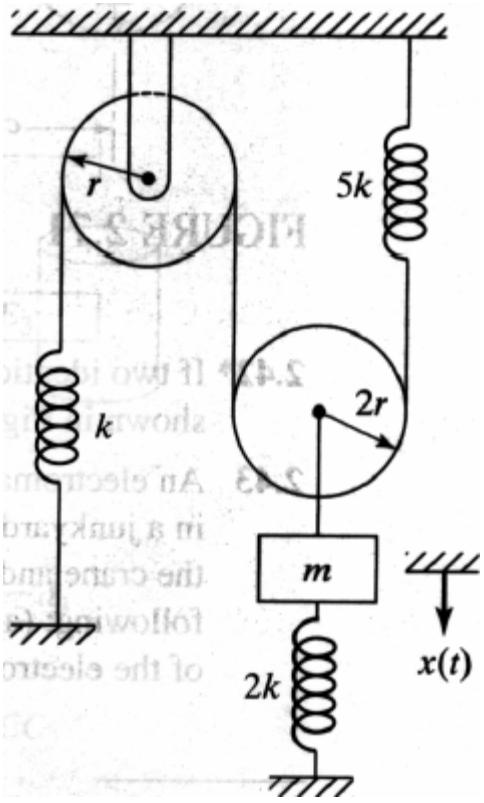


Figure 4

5) Draw the free-body diagram and derive the equation of motion using Newton's second law of motion for the systems shown in Figure 5.

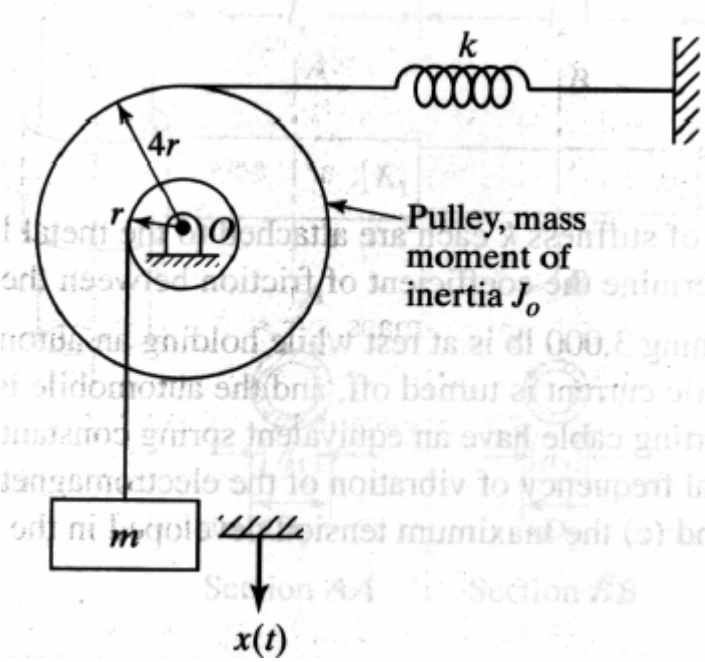


Figure 5

6) Derive the equation of motion of the system shown in Figure 6, using the following methods:

(a) Newton's second law of motion,
(b) D' Alembert's principle.
(c) Principle of virtual work.

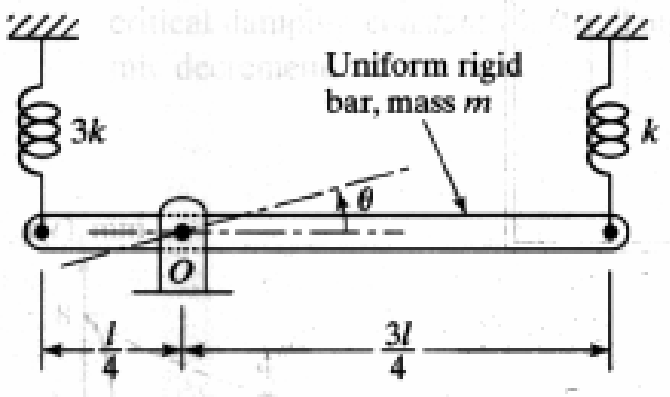


Figure 6